

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) In a physical network of nodes comprising a hierarchical structure in which a node is considered to be at a higher level than a parent node to which it connects when joining the network wherein the network comprises:

at least one central node,

a plurality of peripheral nodes, and

a hierarchical structure interconnecting said at least one central node and said plurality of peripheral nodes, the hierarchical structure being configured such that a node is considered to be at a higher level than a parent node to which it connects when joining the network, and network constraints are set such that for each of said at least one central node and each of said plurality of peripheral nodes a maximum number of connections are permitted, and each peripheral node in the network in the network is not allowed to have fewer connections than said at least one central node,

a node comprising:

a parent node identifier arranged to identify a parent node at a lowest level in the network that is able to maintain secondary connections to other nodes in the network of the same lowest level;

a connection requester arranged to request one of the secondary connections of the parent node to other nodes in the network of the same level be terminated and reallocated to the node if

the identified parent node has no free links to become a primary connection between the identified parent node and the node;

a connection initiator and maintainer arranged to initiate and maintain a specified number $k-1$ of further connections between the node and other nodes in the network having the same level in the hierarchy as the node and which are advertising a spare connection;

wherein the node is constrained by the same connection rules as other nodes in the network to have a maximum number of k connections, and

if the node is a peripheral node the node has at least the same number of connections as more central nodes in the network.

2. Cancelled

3. (Previously Presented) A node according to claim 1, further adapted to attempt to maintain the specified number of $k-1$ further connections between the node and other nodes in the network by periodically carrying out:

for each unallocated one of the $k-1$ connections, selecting a node from one or more candidate nodes, and forming a connection with the selected node, until either the $k-1$ further connections have been successfully completed or there are no more candidate nodes.

4. (Previously Presented) A node according to claim 3, wherein selecting a peer node comprises selecting the peer node at random from the one or more candidate nodes.

5. (Previously Presented) A node according to claim 3, wherein selecting the node comprises selecting the node on the basis of the range of the candidate nodes to the node.

6. (Original) A node according to claim 5, wherein the network comprises an overlay network formed over an underlying network of nodes, and wherein the range between a candidate node and the node comprises the number of links between them in the underlying network.

7. Cancelled

8. (Previously Presented) A node according to claim 6, further adapted to identify another node as a prospective parent node on the basis of the range of the other node to the node.

9. (Previously Presented) A node according to claim 6, further adapted to identify another node as a prospective parent node if it is within a specified range of the node.

10. (Previously Presented) A node according to claim 1, further adapted, in the event that the primary connection fails, to re-establish a primary connection with another node which is at a lower level in the network hierarchy than the node.

11. (Previously Presented) A network, comprising a plurality of nodes each according to claim 1, in which the specified number k of connections is substantially the same for every node.

12. (Currently Amended) A method of joining a node to a physical network, ~~the network comprising a hierarchical structure in which a node is considered to be at a higher level than a parent node to which it connects when joining the network~~ wherein the network comprises:

at least one central node,

a plurality of peripheral nodes, and

a hierarchical structure interconnecting said at least one central node and said plurality of peripheral nodes, the hierarchical structure being configured such that a node is considered to be at a higher level than a parent node to which it connects when joining the network, and network constraints are set such that for each of said at least one central node and each of said plurality of peripheral nodes a maximum number of connections are permitted, and each peripheral node in the network in the network is not allowed to have fewer connections than said at least one central node, the physical network having a topology type in which each node joining the network is constrained by the same connection rules to have a maximum number of k connections, and wherein the peripheral nodes are not allowed to have fewer connections than the ~~more~~-central nodes in the network, the method comprising:

identifying a parent node at a lowest level in the network that is to maintain secondary connections to other nodes in the network of the same lowest level;

requesting one of the secondary connections of the parent node to other nodes in the network of the same level be terminated and reallocated to the node if the identified parent node has no free links to become a primary connection between the identified parent node and the node;

initiating and maintaining a specified number $k-1$ of further connections between the node and other nodes in the network having the same level in the hierarchy as the node and which are advertising a spare connection, the node being constrained to have at least the same number of connections as ~~more~~ central nodes in the network.

13. Cancelled

14. (Previously Presented) A method according to claim 12, in which attempting to maintain the specified number of $k-1$ further connections to the other nodes in the network comprises periodically carrying out:

for each unallocated one of the $k-1$ connections, selecting a node from one or more candidate nodes, and forming a connection with the selected node, until either the $k-1$ further connections have been successfully completed or there are no more candidate nodes.

15. (Previously Presented) A method according to claim 12, in which selecting a peer node comprises selecting the peer node at random from the one or more candidate nodes.

16. (Previously Presented) A method according to claim 14, wherein selecting the node comprises selecting the node on the basis of the range of the candidate nodes to the node.

17. (Original) A method according to claim 16, wherein the network comprises an overlay network formed over an underlying network of nodes, and wherein the range between a candidate node and the node comprises the number of links between them in the underlying network.

18. Cancelled

19. (Previously Presented) A method according to claim 17, comprising identifying another node as a prospective parent node on the basis of the range of the other node to the node.

20. (Previously Presented) A method according to claim 17, comprising identifying another node as a prospective parent node if it is within a specified range of the node.

21. (Previously Presented) A method according to claim 12, further comprising, in the event that the primary connection to the identified parent fails, re-establishing a primary connection with another node which is at a lower level in the network hierarchy than the node.

22. (Previously Presented) A method of operating a network which comprises a plurality of nodes, the method comprising performing for every node the method according to claim 12, and in which the specified number $k-1$ of connections is substantially the same for every node.

23. (Previously Presented) A tangible data store containing a computer program comprising instructions for causing one or more processors to operate as the node according to claim 1 when the instructions are executed by the processor or processors.

24. (Previously Presented) A storage medium carrying computer readable code representing instructions for causing one or more processors to operate as the node according to claim 1 when the instructions are executed by the processor or processors.

25. Cancelled

26. (Previously Presented) A tangible data store containing a computer program comprising instructions for causing one or more processors to perform the method according to claim 12 when the instructions are executed by the processor or processors.

27. (Previously Presented) A storage medium carrying computer readable code representing instructions for causing one or more processors to perform the method according to claim 12 when the instructions are executed by the processor or processors.

28. Cancelled

29. (Previously Presented) A node as claimed in claim 1, wherein the node is adapted upon receipt of a request from a further node desiring to form its primary connection with the

node, and in the event that none of the $k-1$ of further connections of the node is unallocated, to apply connection rules comprising:

selecting one of the further $k-1$ connections which is not a primary connection for one of the other nodes; and

re-allocating that selected further connection to the further node so as to form the primary connection for the further node.

30. (Previously Presented) A method as claimed in claim 12 wherein, upon receipt of a request from a further node desiring to form its primary connection with the node, and in the event that none of the $k-1$ connections of the node is unallocated, the node applies connection rules comprising:

selecting one of the further connections which is not a primary connection for one of the other nodes; and

re-allocating that selected further connection to the further node so as to form the primary connection for the further node.

31. (Currently Amended) A method of joining a node to a physical network, ~~the network~~ having a topology type in which each node joining the network is constrained by the same connection rules to have a maximum number of connections wherein the network comprises:

at least one central node,

a plurality of peripheral nodes, and

a hierarchical structure interconnecting said at least one central node and said plurality of peripheral nodes, the hierarchical structure being configured such that a node is considered to be at a higher level than a parent node to which it connects when joining the network, and network constraints are set such that for each of said at least one central node and each of said plurality of peripheral nodes a maximum number of connections are permitted, and each peripheral node in the network in the network is not allowed to have fewer connections than said at least one central node, and wherein the peripheral nodes are not allowed to have fewer connections than the ~~more~~ central nodes in the physical network, wherein in order to join a new node to the network, the network comprising each node having at most k connections, the method applies the following connection rules in order to join a new node to said network in which each node has a maximum of k connections:

identify the node with the lowest height in the network hierarchy that is maintaining horizontal connections or unallocated links;

if the identified node has no free links, then request one of the horizontal connections to be terminated and re-allocated to the joining node, the link becoming vertical in the process,

initiating k-1 horizontal links between the joining node and other nodes in the network having the same height as the joining node and which are advertising a spare connection.

32. (Currently Amended) A physical network of nodes, ~~the network comprising:~~
~~a plurality of~~ wherein the network comprises:
at least one central node,
a plurality of peripheral nodes, and

a hierarchical structure interconnecting said at least one central node and said plurality of peripheral nodes, the hierarchical structure being configured such that a node is considered to be at a higher level than a parent node to which it connects when joining the network, and network constraints are set such that for each of said at least one central node and each of said plurality of peripheral nodes a maximum number of connections are permitted, and each peripheral node in the network in the network is not allowed to have fewer connections than said at least one central node.

said nodes ~~which can be being~~ interconnected and disconnected from each other for communication purposes,

~~a hierarchical structure in which a node is considered to be at a higher level than a parent node to which it connects when joining the network;~~

each node being arranged (a) to identify a parent node at the lowest level in the network that is able to maintain secondary connections to other nodes in the network of the same lowest level, (b) to request one of the second connections of the parent node to other nodes in the network of the same level be terminated and reallocated to the node if the identified parent node has no free links to become a primary connection between the identified parent node and the node, and (c) to initiate and maintain a specified number $k-1$ of further connections between the node and other nodes in the network having the same level in the hierarchy as the node and which are advertising a spare connection;

wherein the network has a topology type in which each node joining the network is constrained by the same connection rules to have a maximum number of k connections and

wherein peripheral nodes have at least the same number of connections as more centrally situated nodes in the network.

33. (New) A virtual overlap network formed on top of an existing physical network of nodes, wherein the virtual overlap network comprises:

at least one central node,

a plurality of peripheral nodes, and

a hierarchical structure interconnecting said at least one central node and said plurality of peripheral nodes, the hierarchical structure being configured such that a node is considered to be at a higher level than a parent node to which it connects when joining the network, and network constraints are set such that for each of said at least one central node and each of said plurality of peripheral nodes a maximum number of connections are permitted, and each peripheral node in the network is not allowed to have fewer connections than said at least one central node,

said nodes being interconnected and disconnected from each other for communication purposes,

each node being arranged (a) to identify a parent node at the lowest level in the network that is able to maintain secondary connections to other nodes in the network of the same lowest level, (b) to request one of the second connections of the parent node to other nodes in the network of the same level be terminated and reallocated to the node if the identified parent node has no free links to become a primary connection between the identified parent node and the node, and (c) to initiate and maintain a specified number $k-1$ of further connections between the

node and other nodes in the network having the same level in the hierarchy as the node and which are advertising a spare connection;

wherein the network has a topology type in which each node joining the network is constrained by the same connection rules to have a maximum number of k connections and wherein peripheral nodes have at least the same number of connections as more centrally situated nodes in the network.